Special issue on Results from Spaceborne Imaging Radar-C / X-band Synthetic Aperture Radar (SIR-C/X-SAR): Foreword

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Abstract. A summary of the missions of the Spaceborne Imaging Radar-C / X-band Synthetic Aperture Radar (SIR-C/X-SAR) is provided, introducing the special **issue** of JGR-Planets.

The two 1994 flights of the Spaceborne Imaging Radar-C / X-band Synthetic Aperture Radar (SIR-C/X-SAR) aboard the Space Shuttle Endeavour represent a major advance in remote sensing technology for studies of planetary surfaces. The SIR-C/X-SAR system is the most advanced imaging radar system to fly in Earth orbit. Synthetic aperture radar (SAR) data were simultaneously recorded at three wavelengths (L-, C-, and X-bands; 23.5, 5.8 and 3.1 cm, respectively), providing the first multi-spectral spaceborne SAR data set. In addition, a data acquisition mode was available for obtaining the full polarimetric scattering matrix from the SIR-C instrument at L- and C-bands.

SIR-C/X-SAR is a cooperative experiment between the National Aeronautics and Space Administration (NASA), the German space agency, Deutsche Agentur für Raumfahrtangelegenheiten (DARA), and the Italian Space Agency, Agenzia Spaziale Italiana (ASI). SIR-C was developed by NASA's Jet Propulsion Laboratory. X-SAR was developed by the Dornier and Alenia Spazio companies, with the Deutsche Forschungsanstalt für Luft- und Raumfahrt (DLR), the major partner in science, operations, and data processing. The experiment provides an evolutionary step in NASA's Spaceborne Imaging Radar (SIR) program that began with the Seasat SAR in 1978, and continued with SIR-A in 1981 and SIR-B in 1984.

The multi-parameter radar imaging capability of SIR-C/X-SAR is utilized in a variety of geophysical applications in the papers contained in this Special Issue of JGR-Planets. The unique sensitivity of radar backscatter to macroscale surface roughness, topography and surface electrical properties, as well as the all-weather, day-night capabilities of SAR imaging are exploited in studies of structural geology, surficial processes, volcano-tectonic terrains, glaciology and other topics. The repeat-pass interferometry data sets acquired by SIR-C/X-SAR are used to generate digital topographic data and for detection of deformation and other changes in surface characteristics. Imaging radar has become an important remote sensing tool for planetary studies, with extensive orbital data already collected at Venus (Magellan, Venera, Pioneer) and planned for Saturn's moon Titan during the upcoming Cassini mission. In addition, Earth-based radar systems are being used extensively to observe the surfaces of the terrestrial planets, icy satellites and small solar system

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bodies. The SIR-C/X-SAR data provide an excellent set of analogue data for planetary observations, with a diversity in targets and observational parameters that allow direct quantitative comparisons of the backscatter behavior of various planetary surfaces observed with different radar systems.

This Special Issue is the third scientific journal issue dedicated to results from the SIR-C/X-SAR missions (see *IEEE Transactions on Geoscience and Remote Sensing*, "Special Issue on SIR-C/X-SAR", July 1995 and *Remote Sensing of the Environment*, "Special Issue on Results from SIR-C/X-SAR", 1996, in press). Analysis of the rich and varied data set from SIR-C/X-SAR is continuing. Interested researchers may obtain SIR-C data from the EROS Data Center, Sioux Falls, South Dakota (World Wide Web address, http://edcwww.cr.usgs.gov/landdaac/sir-c/sir-c.html) and X-SAR data from DLR (http://www.op.dlr.de/ne-hf/SRL.html). Additional information about the NASA Jet Propulsion Laboratory's activities in imaging radar may be found at http://southport.jpl.nasa.gov.

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